CLAIMS

1. A high-stiffness high-strength thin steel sheet comprising C: 0.02-0.15%, Si: not more than 1.5%, Mn: 1.0-3.5%, P: not more than 0.05%, S: not more than 0.01%, Al: not more than 1.5%, N: not more than 0.01% and Ti: 0.02-0.50% as mass%, provided that C, N, S and Ti contents satisfy the relationships of the following equations (1) and (2):

$$Ti^* = Ti-(47.9/14)\times N-(47.9/32.1)\times S \geq 0.01 \cdots\cdots (1)$$

$$0.01 \leq C-(12/47.9)\times Ti^* \leq 0.05 \cdots\cdots (2)$$

and the remainder being substantially iron and inevitable impurities, and having a texture comprising a ferrite phase as a main phase and having a martensite phase at an area ratio of not less than 1%, and having a tensile strength of not less than 590 MPa and a Young's modulus of not less than 230 GPa.

2. A high-stiffness high-strength thin steel sheet according to claim 1, which further contains one or two of Nb: 0.005-0.04% and V: 0.01-0.20% as mass% in addition to the above composition and satisfies the relationships of the above equation (1) and the following equation (3) instead of the equation (2):

$$0.01 \leq C-(12/47.9)\times Ti^*-(12/92.9)\times Nb-(12/50.9)\times V \leq 0.05 \cdots (3)$$

3. A high-stiffness high-strength thin steel sheet according to claim 1 or 2, which further contains one or more of Cr: 0.1-1.0%, Ni: 0.1-1.0%, Mo: 0.1-1.0%, Cu: 0.1-2.0% and B: 0.0005-0.0030% as mass% in addition to the above composition.

4. A method for producing a high-stiffness high-strength thin steel sheet comprising subjecting a starting material of steel comprising C: 0.02-0.15%, Si: not more than 1.5%, Mn: 1.0-3.5%, P: not more than 0.05%, S: not more than 0.01%, Al: not more than 1.5%, N: not more than 0.01% and Ti: 0.02-0.50% as mass%, provided that C, N, S and Ti contents satisfy the relationships of the following equations (1) and (2):

$$Ti^* = Ti-(47.9/14)\times N-(47.9/32.1)\times S \geq 0.01 \cdots\cdots (1)$$

$$0.01 \leq C-(12/47.9)\times Ti^* \leq 0.05 \cdots\cdots (2)$$

to a hot rolling step under conditions that a total rolling reduction below 950°C is not less than 30% and a finish rolling is terminated at 800-900°C, coiling the hot rolled sheet below 650°C, pickling, subjecting to a cold rolling at a rolling reduction of not less than 50%, raising a temperature to 780-900°C at a temperature rising rate from 500°C of 1-30°C/s to conduct soaking, and then cooling at a cooling rate up to 500°C of not less than 5°C/s to conduct annealing.

5. A method for producing a high-stiffness high-strength thin steel sheet according to claim 4, wherein the starting material of steel further contains one or two of Nb: 0.005-0.04% and V: 0.01-0.20% as mass% in addition to the above composition and satisfies the relationships of the above equation (1) and the following equation (3) instead of the equation (2):

$$0.01 \leq C-(12/47.9)\times Ti^{*}-(12/92.9)\times Nb-(12/50.9)\times V \leq 0.05 \quad \cdots \quad (3)$$

6. A method for producing a high-stiffness high-strength thin steel sheet according to claim 4 or 5, wherein the staring material of steel further contains one or more of Cr: 0.1-1.0%, Ni: 0.1-1.0%, Mo: 0.1-1.0%, Cu: 0.1-2.0% and B: 0.0005-0.0030% as mass% in addition to the above composition.